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TITLE: Prescan for optimization of mri scan parameters

Abstract Paragraph:

The invention relates to a method and apparatus for generating magnetic resonance images. In order to achieve high quality magnetic resonance imaging combined with a user-friendly operating of a magnetic resonance apparatus it is proposed to use data obtained from a reference scan comprising SENSE reference data to determine an optimum scan parameter set taking into account a chosen target value of a specific scan parameter such as the scan time or the signal-to-noise ratio. Based on the reference scan, image noise is predicted for various sets of scan parameters (alternative use of SENSE or intrinsic foldover without SENSE; various orientations of the phase encoding direction within the slice plane). An optimum scan parameter set is determined (shortest scan time to match target SNR or highest SNR to match target scan time).

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Brief Summary Text:

[0006] This object is achieved according to the invention by a method for generating magnetic resonance images using a magnetic resonance apparatus, the method comprising the steps of acquiring a reference scan, providing the magnetic resonance apparatus with a target value of a specific scan parameter, and determining, by the magnetic resonance apparatus and based on reference scan data, an optimum scan parameter set according to the target value of the specific scan parameter.

Brief Summary Text:

[0007] The object of the present invention is also achieved by an apparatus for generating magnetic resonance images comprising an acquisition device for acquiring a reference scan, an operating device for providing the apparatus with a target value of a specific scan parameter, and a control device for determining, based on reference scan data, an optimum scan parameter set according to the target value of the specific scan parameter.

Brief Summary Text:

[0010] The present invention enables a high quality magnetic resonance imaging, because an optimum scan parameter set is determined automatically by the magnetic resonance apparatus. Human error can be much reduced. Moreover the operating of the magnetic resonance apparatus is user-friendly, because merely a target value of a specific scan parameter has to be provided. This can be done easily even by an unexperienced operator. The optimum scan parameter set is determined solely by using data already available after a reference scan. Because such reference scans are acquired by default, there are no additional tasks necessary compared to known techniques. In other words, data already available is used for enhancing and optimizing the magnetic resonance imaging procedure. As a further result the subject to be examined will not unnecessarily be exposed to high radiofrequency magnetic fields.

Description of Disclosure:

[0020] A magnetic resonance apparatus on which the preferred embodiment can be implemented is shown in a simplified block diagram of FIG. 1. The apparatus 1 basically comprises an acquisition device 2, an operating device 3 and a control device 4 connecting acquisition device 2 and control device 4. The acquisition device 2 is adapted for acquiring magnetic resonance scans including survey scans and reference scans. It includes inter alia coils 5 for creation of gradient magnetic fields, RF signal antennae, readout devices, current supply devices, high frequency generators etc. A subject 6 is placed within the magnet on a subject table 7. The operating device 3 is adapted for providing the apparatus with a target value of a specific scan parameter. It includes a computer console with input and output devices, e.g. a computer monitor 8 and a keyboard 9. Other input devices, e.g. touch screen or mouse might be used as well. The control device 4 is adapted for determining the optimum scan parameter set and for controlling the acquisition device 2. It includes a computer 10 including CPU, memory and storage means etc. for calculating the image noise and determining the optimum scan parameter set. For this purpose the computer 10 comprises a computer program adapted to perform the inventive method.

Description of Disclosure:

[0028] The noise of each image is calculated in step 15 using the sensitivity matrices obtained from the three-dimensional reference scan before the actual imaging. In other words the reference data is reused for optimizing the scan parameter of the actual magnetic resonance scan of the subject 6. The signal value p of an image pixel is calculated according to:  $p = (S \cdot \sup \cdot H \cdot \text{PSI} \cdot \sup \cdot -1S) \cdot \sup \cdot -1S \cdot \sup \cdot H \cdot \text{PSI} \cdot \sup \cdot -1 m$  wherein S is the sensitivity matrix, .PSI. is the noise correlation matrix and m is the measurement data of all coil elements 5.

## CLAIMS:

1. A method for generating magnetic resonance images using a magnetic resonance apparatus, the method comprising the steps: acquiring a reference scan, providing the magnetic resonance apparatus with a target value of a specific scan parameter, and determining, by the magnetic resonance apparatus and based on reference scan data, an optimum scan parameter set according to the target value of the specific scan parameter.
10. An apparatus for generating magnetic resonance images comprising: an acquisition device for acquiring a reference scan, an operating device for providing the apparatus with a target value of a specific scan parameter, and a control device for determining, based on reference scan data, an optimum scan parameter set according to the target value of the specific scan parameter.
11. A computer program for generating magnetic resonance images using a magnetic resonance apparatus comprising: computer instructions to acquire a reference scan, computer instructions to provide the magnetic resonance apparatus with a target value of a specific scan parameter) computer instructions to determine, based on reference scan data, an optimum scan parameter set according to the target value of the specific scan parameter, when the computer program is executed in a computer.

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